The VEX Belt Drive Kit

Created by the Automata Lemon Bot Alliance (ALBA)

Introduction

The VEX Belt Drive Kit was designed as a compact way to provide precise linear motion with minimal backlash. It allows a linear slide kit or linear motion kit to be driven using a standard XL belt. The belt can fit inside the linear slide when a low-profile solution is needed. The kit is designed to work with standard and steel-core XL belt up to 9mm wide, allowing users to select the belt strength most suitable for their application.

How the Part Would be Used

The kit includes a belt drive bracket, an 8-tooth drive pulley, two idler pulleys, two belt clamps, and 6 feet of belt stock as well as the necessary hardware. The belt drive bracket is used to mount two idler pulleys, a drive pulley, and a motor to a slide truck. The two idler pulleys and drive pulley are mounted in triangular configuration to maximize contact between the belt and the drive pulley (see image 4). The belt clamps are then used to connect the ends of the belt to the ends of the slide. The belt stock can be cut to the desired length depending on the application or length of slide. Once assembled, either the slide or the truck can be secured to a fixed point on the robot's frame. The other component can then be secured to the part being actuated.

This kit could be used for any application requiring linear motion. Some examples include linear lifts, climbing/elevation mechanisms (see image 7), outriggers, etc.

How Inventor was Used

Autodesk Inventor Professional was used to design, render, and animate the belt drive kit. First, the sketch, extrude, fillet, chamfer, and pattern tools were used to create each of the new components. The assembly environment was then used to assemble the parts to ensure that they fit together and moved properly. The Inventor Studio environment was used to set up renderings of the final kit, as well as to create several animations showing kit assembly and use. The final designs for the new parts were then exported as .stl files and used to 3D print a physical prototype (see images 8-10).

Design Process

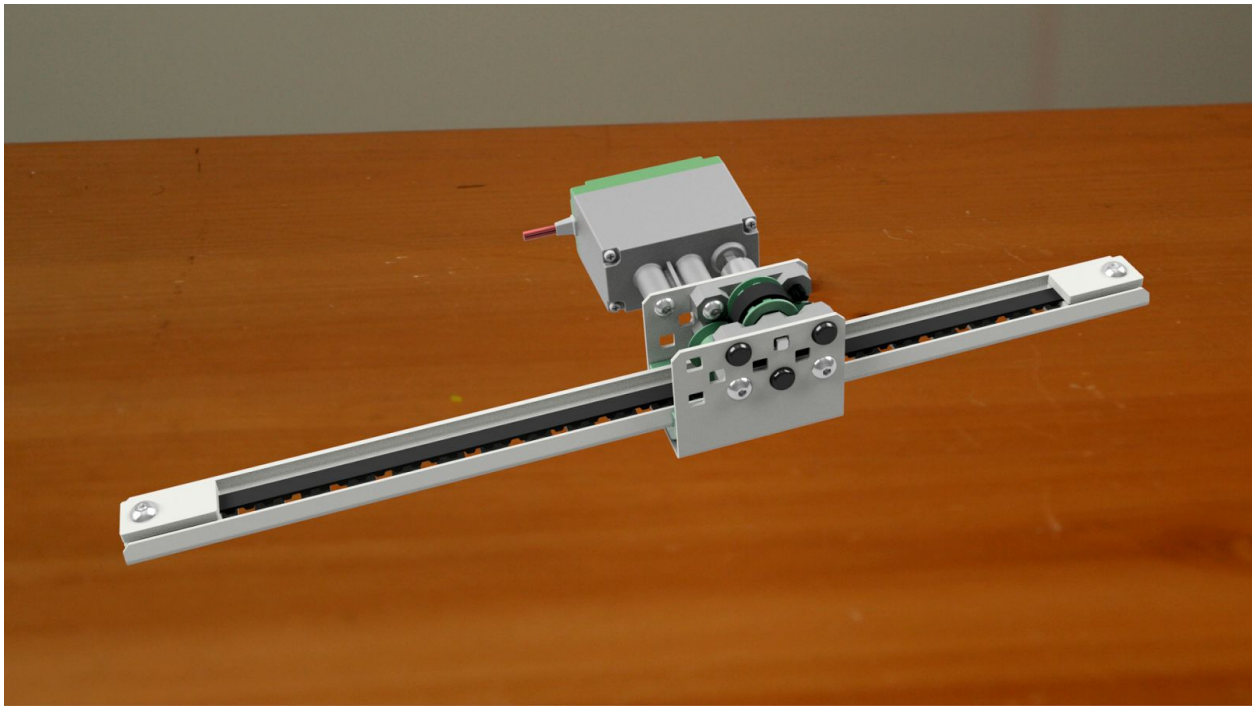
I started by gathering ideas from several teams on what products they felt would have helped them most when building robots for the VEX Robotics Competition. We arrived at the idea of a belt drive kit due to my team's need of a compact, linear lift in several past competitions, as well as another team's need for a low-backlash gantry system for a non-competition VEX project. As I developed the design for the belt drive kit, I took

into account how it would fit in with the VEX Robotics Design System. The kit is designed to be compatible with high strength shafts and gear inserts, fit the standard vex hole pattern, and work with both styles of linear slide. Once the design was complete, a 3D printed prototype was created to demonstrate the kit's operation and feasibility.

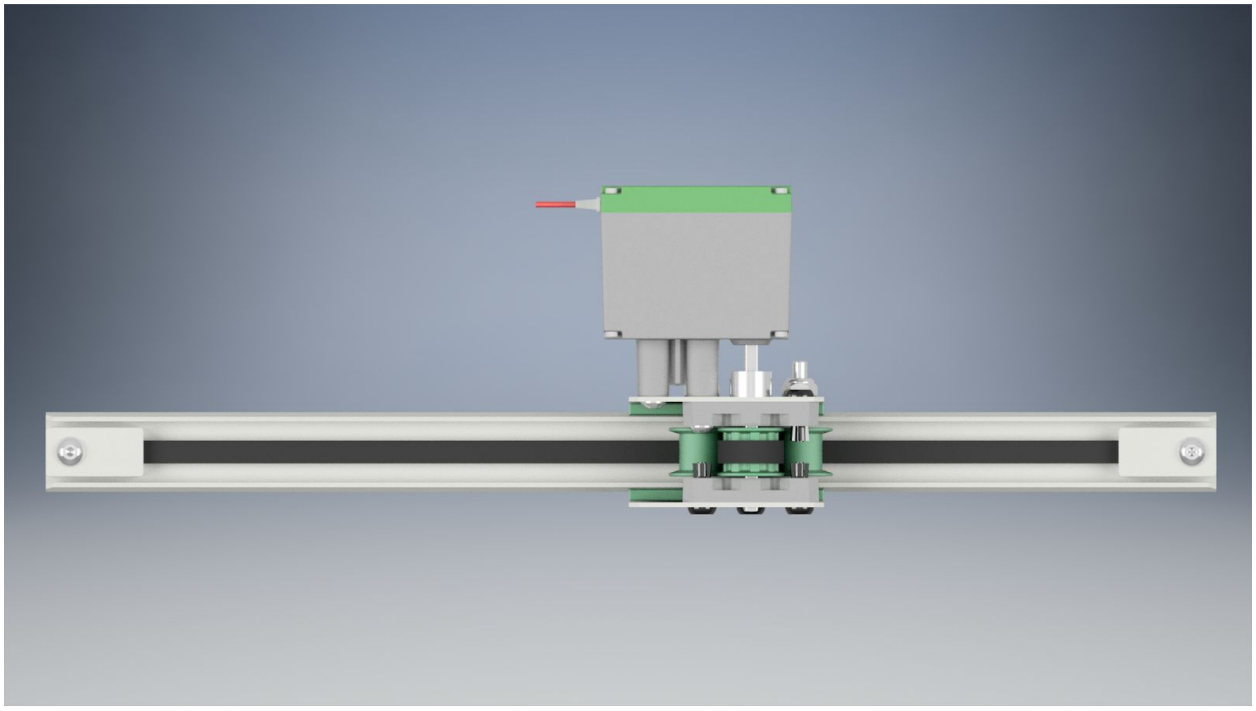
Conclusion

I have used and will continue to use Autodesk Inventor to help design our robots and other projects. I have found that designing a competition robot in a CAD software package before building it is extremely helpful for determining whether an idea is feasible before purchasing parts for it or putting in a significant amount of time building it. I believe that proficiency with 3D CAD software will greatly help me in my future career as a robotics engineer. Many of the concerns faced in competition robotics, such as budget and a limited development time, translate directly to real-world applications. Knowledge of CAD software will help me to better address these concerns.

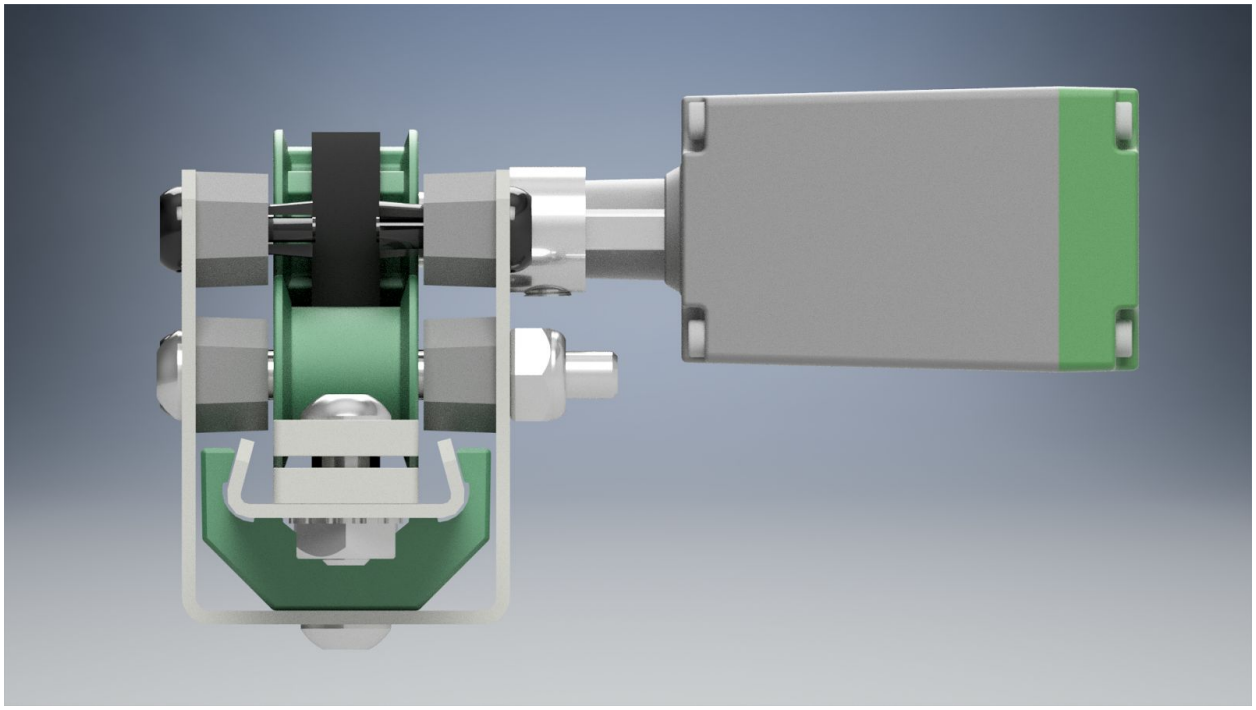
1. The VEX Belt Drive Kit



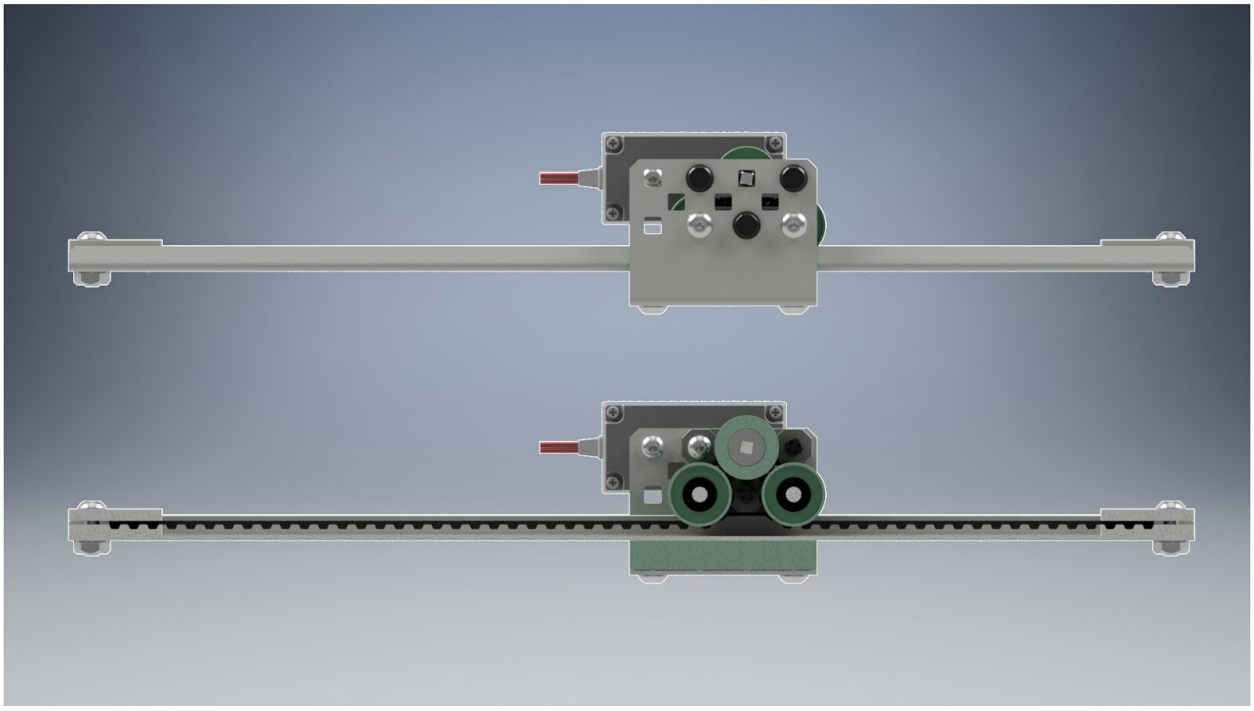
2. Top View



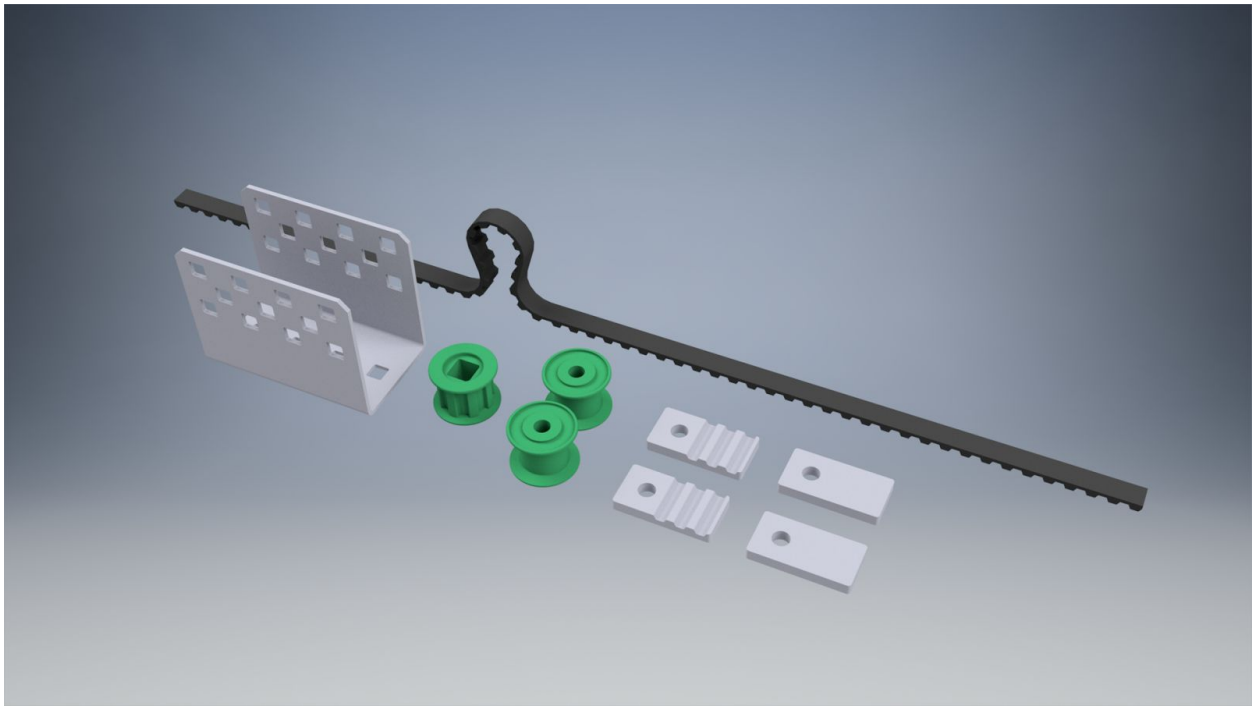
3. Front View



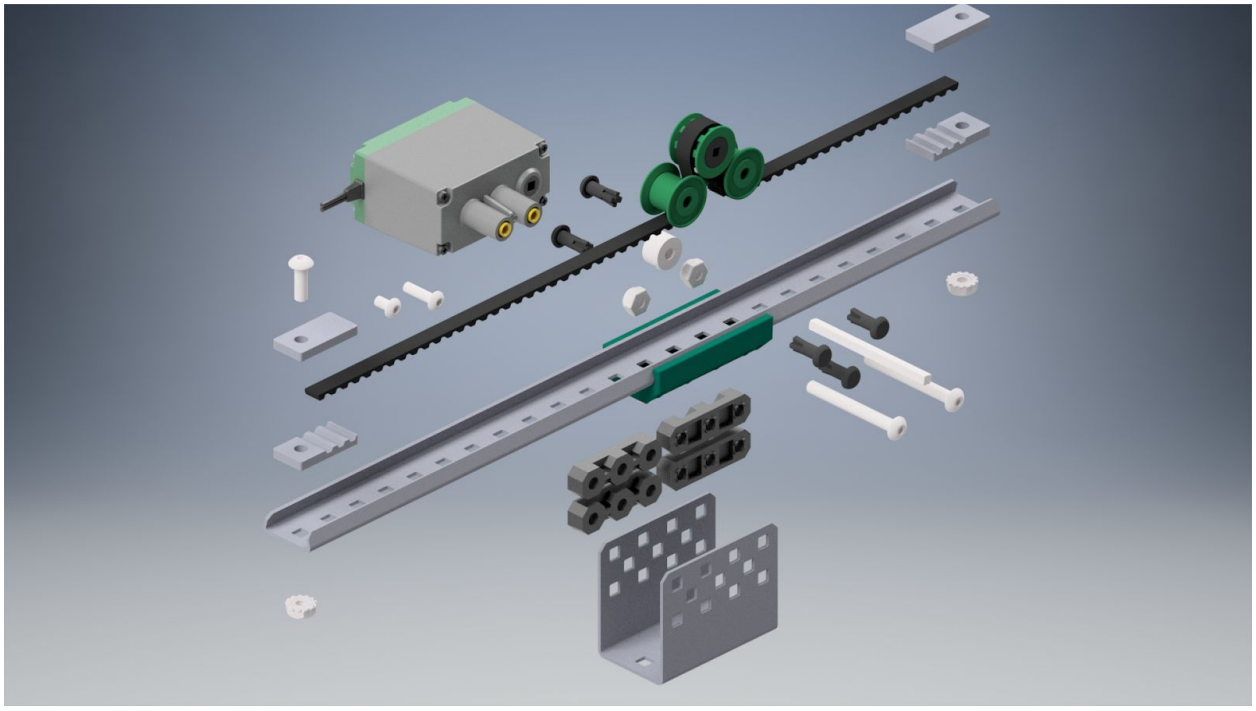
4. Side View



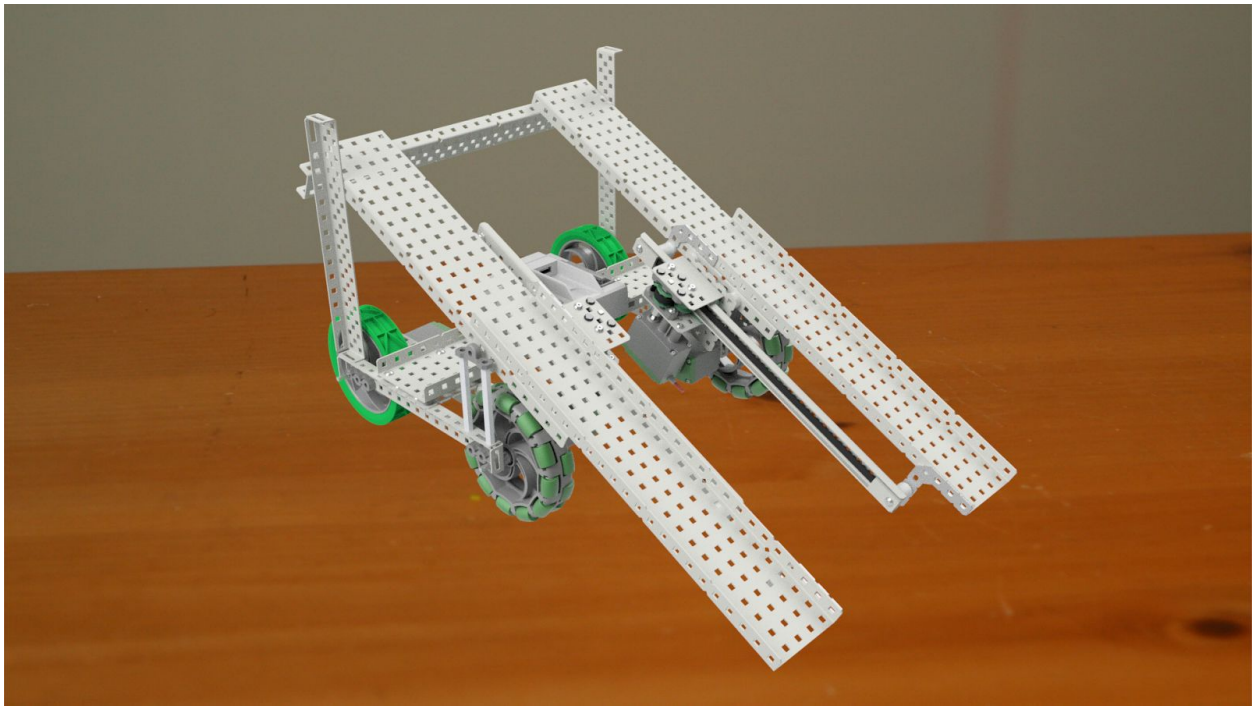
5. New Parts



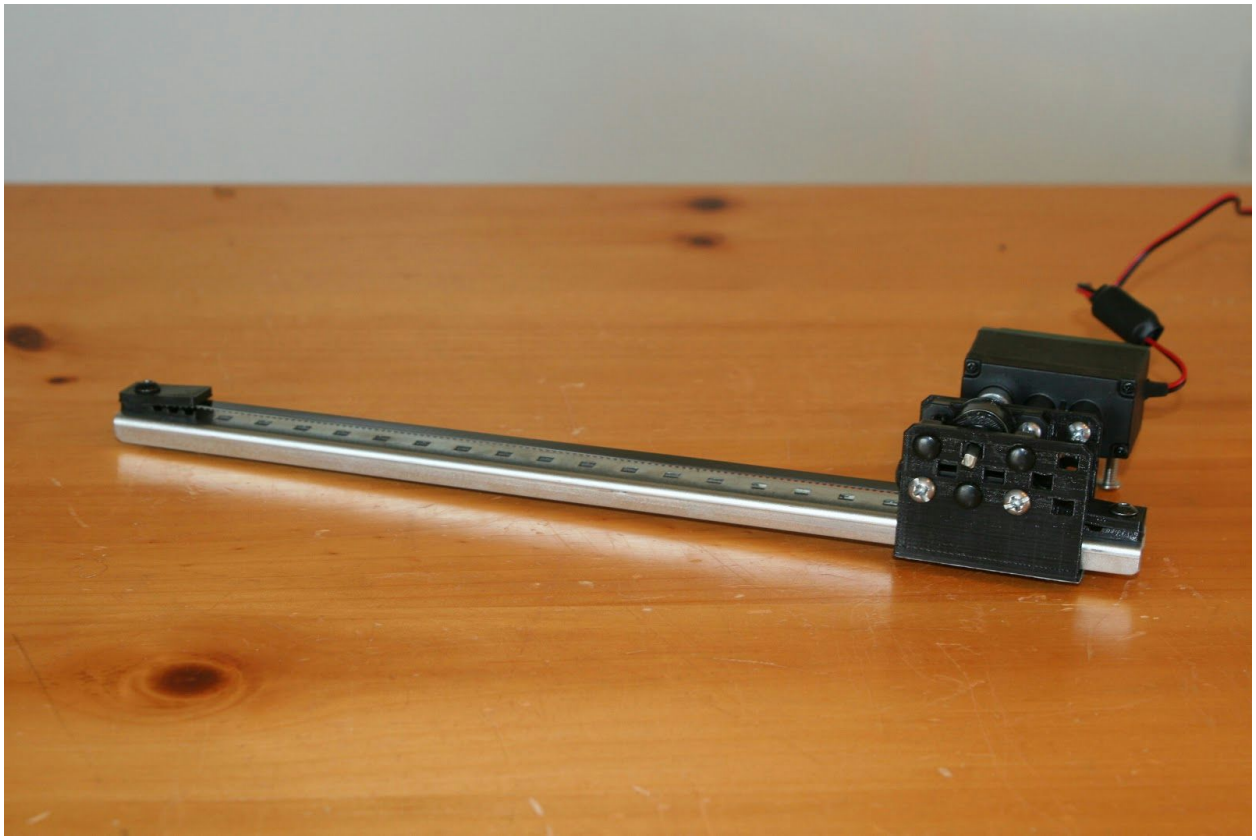
6. Exploded Assembly



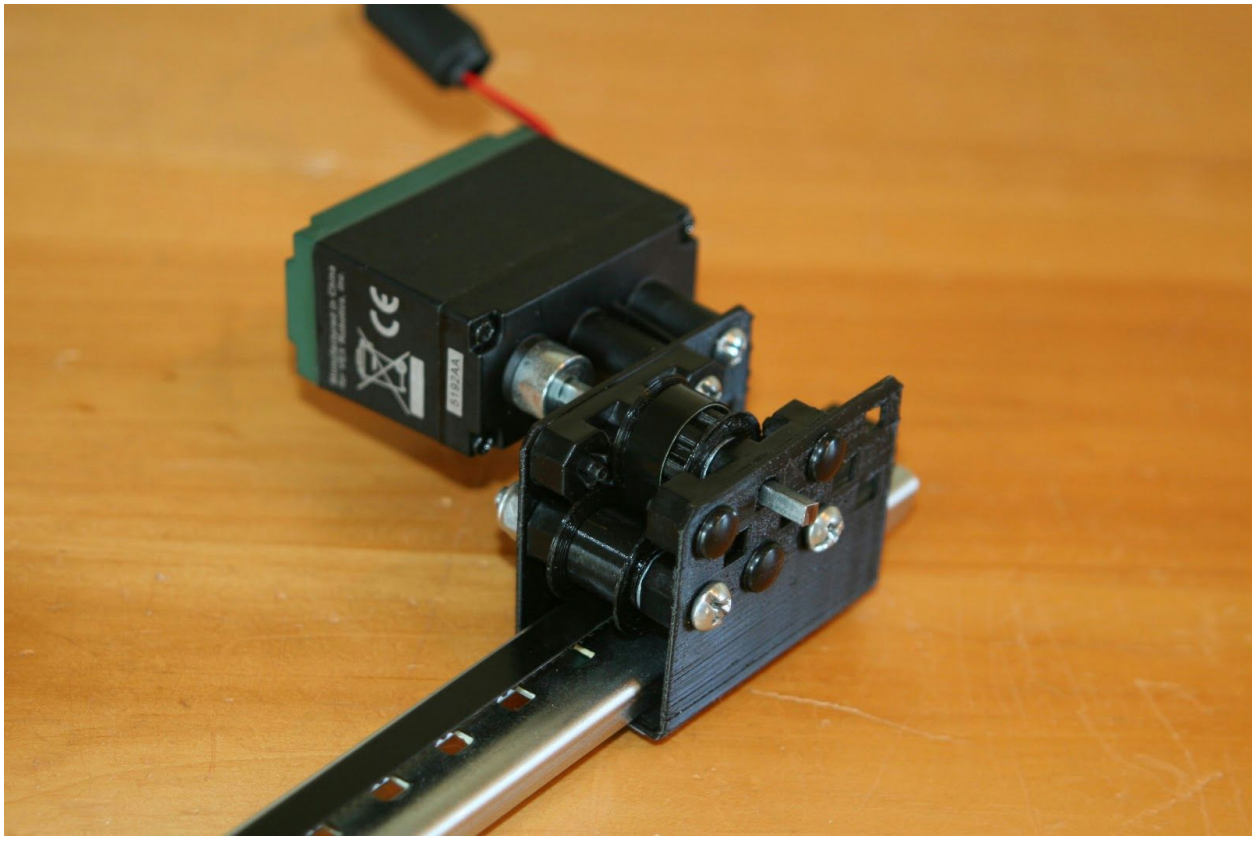
7. Extending Ramp Using the Belt Drive Kit



8. 3D Printed Prototype



9. Prototype Drive Assembly



10. Prototype Kit